

## Research article

# Benefits of an exercise wellness program after spinal cord injury

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**Objective:** To describe the initial benefits of a structured group exercise program on exercise frequency and intensity, perceived health, pain, mood, and television watching habits.

**Design:** Pre-test/post-test.

**Participants/methods:** Eighty-nine persons with SCI participated voluntarily in a no-cost, twice weekly physical therapy group exercise class over 3 months. Forty-five persons completed pre- and post-participation interviews on exercise frequency and intensity, perceived health, pain, mood, sleep, and television watching habits.

**Results:** Mean participant age of the respondents was 43.82 years. 49% had AIS C or D injuries, 24% had AIS A,B paraplegia, 9% had AIS A,B C1-C4 and 18% had AIS A,B C5-C8. 75.6% of participants were male and 84.4% had a traumatic etiology as the cause of their SCI. There was a significant improvement in days of strenuous and moderate exercise as well as health state. There was an average decrease in pain scores, depression scores, number of hours spent watching television, and days/week of mild exercise.

**Conclusion:** Participation in structured, small group exercise as a component of a wellness program after SCI shows promise for improving regular exercise participation and health state, but benefits may also occur across other areas of health and function including mood, pain, and hours spent watching television. Further follow-up is needed to determine whether improvements can be maintained after program completion and across all neurological levels.

**Keywords:** Exercise, Quality of life, Spinal cord injury

## Introduction

Spinal cord injury (SCI) presents unique challenges to achieving and maintaining optimal physical function, one important dimension of wellness. The complex and widespread physiologic consequences of SCI and the associated physical inactivity lead to heightened vulnerability to secondary health complications, including cardiovascular disease. SCI is associated with a higher prevalence of cardiovascular risk factors, including adverse lipid profiles, adiposity, disorders of carbohydrate metabolism, as well as earlier onset and greater burden of coronary artery disease.<sup>1-5</sup> While these risk factors are addressed in the general population by targeted health promotion to increase exercise, SCI often limits not only the ability to engage in exercise, but also the range of feasible options for physical activity.

Surveys of people with SCI cited opportunities for exercise, physical activity and recreation as the most

desired wellness-promotion activities.<sup>6-8</sup> Furthermore, there is growing evidence to support the benefits of exercise and leisure time physical activity on the physiologic<sup>9-13</sup> and overall psychosocial<sup>11,14-21</sup> function of individuals with SCI. Despite this, surveys have noted low participation rates in exercise and leisure time physical activity compared to the general population.<sup>22-26</sup> Non-exercisers identified barriers such as lack of accessible fitness facilities, unaffordable equipment and gym memberships, absence of personal assistants knowledgeable about SCI-specific exercise programs, and fear of injury.<sup>6,17,19,27-34</sup> A higher neurologic level of injury may present challenges to exercise participation in the absence of specialized equipment and training.

Despite the health risks faced by persons with SCI and the reported benefits of exercise, there is a paucity of large scale programs that target promotion of physical activity participation among those with SCI. Efforts to address this include publication of specific exercise guidelines for this population, and more rigorous attempts to define fitness activities after

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SCI.<sup>12,35,36</sup> Studies have also noted the benefit of partnerships between academic and community programs, and programs that offer staff support for physical activity participation.<sup>37,38</sup>

The *SCI Transitions Exercise Group* is an adapted group exercise class supervised by physical therapists, using a hospital-based outpatient rehabilitation gym. Additional support for the class was obtained from therapy interns currently enrolled in the University of Washington's Doctorate of Physical Therapy program. This program serves as an introduction to an exercise regimen that is individualized by a physical therapist, using accessible equipment. These classes offer the following benefits for participants:

- No-cost access to regular (twice weekly) aerobic and strengthening exercises to safely maximize independence and improve motivation to integrate these skills into daily life.
- Structured opportunities for coordinated social interaction with peers living with SCI.
- Consistent supervision from skilled SCI care providers.
- Education on prevention, wellness, community advocacy for accessible exercise and mobility options, and healthy lifestyle choices.
- Facilitated transition from rehab-based skilled services to community services.

The *Transitions Exercise Group* was offered at two UW Medicine institutional sites: University of Washington Medical Center and Harborview Medical Center. After three months of participation, the individual is expected to transition to a community-based exercise program and to show improvement in their activity level as well as their psychosocial functioning. During participation in the *Transitions Exercise Group*, participants receive instruction and information on planning for this transition to the community and were assessed for any improvements. In this paper, we describe results from our program evaluation on 45 of 89 participants who completed assessments after participation in the group exercise class.

## Methods

Participants were referred to the *Transitions Exercise Group* by their outpatient rehabilitation provider or self-referred from advertisements posted at our facilities, by recommendation of other participants, or through the website ([www.sci.washington.edu/transitions](http://www.sci.washington.edu/transitions)). A person was able to participate in the group if they had a diagnosis of spinal cord dysfunction, they were 18 years of age or older, and deemed medically stable by a medical provider to participate in a structured exercise program. A medical referral form with health screening information was required and included review of

conditions (e.g. poor bowel/bladder control, ischial or sacral pressure ulcers, limiting spasticity) which could impact participation in exercise and a request for other relevant medical history or precautions that would need to be considered. Neurological level and severity of injury were not determinants of eligibility. An additional telephone screening process by a skilled physical therapist determined their interest in, and commitment to, engaging in a structured exercise program, and assessed transportation needs. If transportation was a barrier, the person was referred to Recreational Therapy to review possible no cost/low cost options in the community to determine whether that barrier could be overcome.

The group exercise classes included four to five participants at each site at a time, and incorporated adapted strength training through use of a cable column, Versatrainer, and dumbbells or cuff weights to perform various resistance exercises and adapted endurance training with use of an upper body ergometer, Nustep, and ball punches. Participants were invited to attend 2 times per week for 3 months. As part of the transition out of the exercise group into the community, a Recreation Therapist conducted tours of local YMCA facilities and provided information and instruction on advocating for needed assistance and possibly equipment at an individual's local exercise facility.

Prior to commencing the group exercise class, participants were asked to complete a pre-participation survey. After transitioning out of the group exercise class, participants were contacted by telephone to attempt to complete the post-participation survey which was identical to the pre-participation survey. The survey included questions about number of days per week over the past week (7 days) that an individual engaged in strenuous, moderate, or mild exercise (with examples provided for each type), hours spent watching television, the EuroQol thermometer<sup>39</sup> to assess current health state, the Patient Health Questionnaire-2<sup>40</sup> to assess possible depressive mood, and the 2 item Bodily Pain Scale<sup>41</sup> from the SF-36. Participant comments were also collected regarding program impact. The current program evaluation was discussed with the University of Washington Human Subjects Division prior to analysis and determined not to be human subjects research based on the Common Rule (45 CFR 46).

## Results

Since its inception in 2011, the *Transitions Exercise Group* had nearly 1800 participant visits to the physical therapy-led group exercise class amongst 89

**Table 1 Participant characteristics**

Characteristics	All Participants	Participants who completed outcome assessment
Number (%)	89	45
Age at time of participation (mean)		43.82 (s.d.=15.31)
Sex		
Male	59 (66.3)	34 (75.6)
Female	30 (33.7)	11 (24.4)
SCI Classification		
AIS C,D*	38 (43)	22 (49)
Paraplegia, AIS A,B	26 (29)	11 (24)
Tetraplegia, C1-4	9 (10)	4 (9)
AIS A,B		
Tetraplegia, C5-8	16 (18)	8 (18)
AIS A,B		
Traumatic SCI**		
Yes	70 (79)	38 (84.4)
No	18 (20)	6 (13.3)

\*Overall, 23 with tetraplegia and 15 with paraplegia and of those completing outcome, 13 with tetraplegia and 9 with paraplegia.

\*\*One individual did not respond to the question related to whether their injury was traumatic or not.

participants. Pre and post-exercise evaluations were available from 45 (of 89) participants.

Participant characteristics for the entire participant group and those who contributed outcome data are described in Table 1. Mean participant age for the 45 subjects who contributed outcome data was 43.82 years. 49% had AIS C or D injuries, 24% had AIS A, B paraplegia, 9% had AIS A,B C1-C4 tetraplegia and 18% had AIS A,B C5-C8 tetraplegia. 75.6% of participants were male and 84.4% had traumatic injuries. On average, individuals were 2.7 years post-injury with a range from less than 1 year to 21 years post-injury.

Results from the 45 participants completing pre and post-exercise evaluations are presented in Table 2. There were no significant differences in characteristics or baseline functioning between the two groups beyond days of mild exercise in the past week. Individuals who completed follow up reported an average of 5.2 days of mild exercise and those who were not followed reported an average of 3.9 days of mild exercise at baseline. There was a significant increase in days per week of strenuous and moderate exercise and a significant improvement in health state. An average improvement was noted across all health measures except for a slight reduction in days per week of mild exercise. However, individuals who participated in the group exercise class, on average, almost doubled their days of strenuous and moderate exercise compared to their initial reports. Mean hours of television watching per week, PHQ-2 depression scores, and bodily pain scores all decreased after participation in

**Table 2 Pre/post interview for individuals in exercise class.**

		Mean	N	Sig.
Days per week of strenuous exercise	PRE	1.10	31	0.01
	POST	2.58		
Days per week of moderate exercise	PRE	1.59	37	0.01
	POST	2.97		
Days per week of mild exercise	PRE	4.92	36	0.08
	POST	3.69		
Hours of TV watching per week	PRE	5.61	44	0.10
	POST	5.04		
Current health state (EuroQOL)	PRE	65.69	39	0.05
	POST	72.38		
PHQ-2 Depression Rating	PRE	1.30	44	0.19
	POST	1.04		
Bodily Pain Subscale from SF-36*	PRE	53.89	43	0.24
	POST	57.50		

\*Higher score on this is considered better—100 would be no pain and no interference.

the exercise group, although these reductions were not found to be statistically significant. Total PHQ-2 scores declined significantly between pre and post participation (19 vs. 22), and fewer were considered depressed (PHQ-2 score  $\geq 3$ , 7 pre- vs. 3 post-participation). Participant comments, excerpted in Table 3, reflect the program's positive influence. We have insufficient data in this sample to assess long-term maintenance of an exercise program in the community after participation in the structured group exercise class.

We found that there were few dropouts. There were some fluctuations in attendance of the group exercise class related primarily to transportation challenges and individual scheduling conflicts. There were no injuries as a result of participation in the class. Additional staffing was often necessary, which was accomplished through the recruitment of student therapists. We offered a free service to problem-solve transportation difficulties and provide mobility resources in the community; participants continue to be screened for this need at the time of program entry. Recreation therapy

**Table 3 Participant comments**

"It was really nice to work with peers and getting to exercise together. That was really important to me."
"My spirit is uplifted more. I have more confidence, standing for longer periods. My overall body strength is a lot better. It has given me a more positive outlook on life."
"I'm doing really well! I thought it was fantastic. I could see the progress while I was there. When we set up a similar program for me at home to duplicate, it was really good. Having another class to go to was way cool. A big Thank You!"
"I absolutely loved the program. Obvious benefits were the physical benefits to become more independent. And the emotional—where I still have a lot and can still improve."
"This class makes me physically stronger and mentally get ready. It gives me sanity."

provided information on getting started with exercise at a gym, how to apply for financial assistance through the YMCA, assessing accessibility throughout the gym, how to advocate for appropriate equipment at a community gym, and answered questions about considerations in the use of a personal trainer.

## Discussion

The *Transitions Exercise Group*, is a novel program that addresses barriers to exercise created by lack of appropriate opportunities and funding for structured, supervised exercise for persons with SCI. Through the group exercise class, individuals with SCI were able to receive access to appropriate equipment, skilled therapy supervision, personalized exercise program development, and mentorship designed to promote wellness. Collaboration with student therapist volunteers to support skilled physical therapists in staffing the exercise classes added a unique educational dimension. Participants became enthusiastic partners in the education of our trainees while the trainees gained valuable clinical experience working with persons with SCI.

Our outcomes to date suggest that providing the opportunity to participate in a supervised group exercise class increased engagement in moderate to strenuous exercise, and resulted in improvements in pain, mood, and perceived health. Exercise group participants, on average, almost doubled their days of strenuous and moderate exercise compared to their initial reports. It is conceivable that the reduction in days of mild exercise may be due to these sessions being replaced by more intensive exercise sessions. Pain, mood, health status, and number of hours spent watching television similarly improved.

We acknowledge several limitations of this program evaluation. One significant limitation is the small sample size of participants completing pre and post-participation surveys. Post-participation surveys were primarily conducted by phone after participation ended and were done by volunteers who had limited time to attempt multiple calls for those individuals who did not respond within a narrow window of time. It is possible that the positive results of our intervention are overestimated, if participants who benefited most from the exercise classes completed the surveys at a higher rate than others. The lack of long-term follow-up data in this sample prevents determination of the sustainability of this program's impact. We also did not ask specifically whether the program addressed barriers to community participation in exercise. Additionally, there were no physiological or anthropometric parameters obtained during this study to document physiologic benefit.

## Conclusion

For persons with SCI, participation in a structured, small group exercise class shows promise for improving regular exercise participation and increasing exercise intensity. The benefits extend across other areas of health, including mood, pain, and perceived health status. As the level of physical activity was found to be a strong determinant of glucose tolerance, independent of the extent of neurological impairment, exploring strategies to promote participation in physical activity will be important for all individuals with SCI.<sup>39</sup> Future investigation should aim to assess whether these outcomes are maintained over time after program completion, and whether physiological parameters similarly improve with this adapted, supervised, small group exercise class.

## Disclaimer statements

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**Conflicts of interest** There are no conflicts-of-interest.

**Ethics approval** This analysis is exempt from human subjects approval as participation in the exercise program was not considered to be participation in research.

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